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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,780	09/28/2007	Jeremy Stephen Matcham	17638-008US1 INTEU/P31704	7827
26161 7590 09/14/2011 FISH & RICHARDSON P.C. (BO) P.O. BOX 1022 MINNEAPOLIS, MN 55440-1022			EXAMINER HAN, KWANG S	
			ART UNIT 1727	PAPER NUMBER
			NOTIFICATION DATE 09/14/2011	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No. 10/584,780	Applicant(s) MATCHAM ET AL.	
	Examiner Kwang Han	Art Unit 1727	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 June 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1-4 and 7-16 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-4 and 7-16 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/28/11</u> . | 6) <input type="checkbox"/> Other: ____. |

WATER MANAGEMENT IN FUEL CELLS

Examiner: K. Han SN: 10/584,780 Art Unit: 1727 September 9, 2011

Detailed Action

1. The Applicant's amendment filed on September 9, 2011 was received. Claims 5 and 6 were cancelled. Claims 1-4, 7-13, 15-17, and 20-27 were amended.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Election/Restrictions

3. Applicant's election with traverse of Group I, Claims 1-16 in the reply filed on September 2, 2011 is acknowledged. The traversal is on the ground(s) that the newly amended claims provide the same special technical feature which provides unity and a contribution over the prior art. This is not found persuasive because the newly amended limitations to the apparatus claims are directed towards intended use limitations. It is noted that neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, it has been held that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim." Applicant is

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reminded that claims 17-27 are withdrawn from further consideration by the examiner, as being drawn to a non-elected invention.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

4. The claim rejections under 35 U.S.C. 112, second paragraph, on claims 1, 4, 9, 10, 11, and 12 are withdrawn, because claim 1 has been amended and Applicants arguments.

5. The terms "normal range of operating conditions" and "normal operating range" respectively in claims 1 and 4 is a relative term which renders the claim indefinite. The term "normal" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For the purposes of examination it will be assumed standard operating and testing conditions as taught within the prior art meets the limitations of a range of normal operating conditions.

Claim Rejections - 35 USC § 103

6. The claim rejection under 35 U.S.C. 103(a) as unpatentable over Brambilla et al. in view of St-Pierre et al. on claims 1-3 and 7-16 is withdrawn, because independent claim 1 has been amended.

7. Claims 1-3 and 7-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brambilla et al. (WO 00/63992) in view of St-Pierre et al. (US 2003/0186093) and Nonobe (US 6524733).

Regarding claims 1-3 and 9-12, Brambilla discloses a method of operating a fuel cell stack (30; Figure 1) having an anode, an ion transfer membrane, and a cathode comprising distributing the gaseous reactants (delivering fluid fuel and oxidant to flow channels), manifolds used to discharge reactants (8:4-25; Example 1, 5), and liquid water provided to the fluid flow channels (11: 21-25; Claim 1) to provide a flow rate so as to maximize the voltage of the single cells (12:3-4) but it does not explicitly teach a relative humidity of 100% being maintained throughout the fluid flow channels and towards increasing the quantity of water delivered as a function of fuel cell current and determining a calibration function based on current and/or air stoichiometry.

St-Pierre teaches a fuel cell which provides sufficient water to the stack to keep the membrane wet and ionically conductive by maintaining the relative humidity at 100% which defines a boundary between drying and wetting conditions [0050, 0078]. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a relative humidity of 100% in the fuel cell of Brambilla because St-Pierre recognizes this humidity level keep the membrane wet and ionically conductive.

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Nonobe teaches a fuel cell system that determines a precise condition of the humidification of the electrolyte membrane of the fuel cell based on the current and voltage of the fuel cell so that adjustments (calibration function) can be performed so that the humidification of the electrolyte membrane remains within a proper range [Abstract] (2:3-46). It would have been obvious to one of ordinary skill in the art at the time of the invention to determine and control the condition of the humidification of the electrolyte membrane of Brambilla and St-Pierre based on the current because Nonobe teaches this provides precise condition information to maintain the humidification in a proper range.

Regarding claims 4, 9, 10, 11, and 12, Brambilla is silent towards increasing the quantity of water in order to maintain a water factor greater than 1.0 for all currents within a normal operating range.

St-Pierre teaches it is generally desirable to operate fuel cells under a wetting condition (water factor greater than 1.0) such that the membrane is properly hydrated but excess accumulated water is not desired if the stack is to be cold started [0082] which could block the pores of substrates and channels thereby teaching the amount of excess water is a result effective variable dependant upon temperature and potential for flooding which is readily recognizes by one of ordinary skill in the fuel cell art. It would have been obvious to one of ordinary skill in the art at the time of the invention to vary the water factor since it has been held that discovering the optimum ranges for a result effective variable such as water factor involves only routine skill in the art in the absence

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of showing of criticality in the claimed range (MPEP 2144.05) In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claims 7 and 8, Brambilla is silent towards the calibration function determined for air stoichiometry.

St-Pierre teaches a number of stack operating parameters can be adjusted to change the operating conditions of a fuel cell including oxidant and fuel stoichiometries which can be adjusted so that the fuel cell operation is changed from a wetting condition to a drying condition or water balance [0078, 0083] with a specific example of an air stoichiometry of 1.8. It would have been obvious to one of ordinary skill in the art at the time of the invention to vary the air stoichiometry of Brambilla because St-Pierre recognizes the air stoichiometry affects the wetting condition of the membrane. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the air stoichiometry since it has been held that discovering the optimum ranges for a result effective variable such as air stoichiometry involves only routine skill in the art in the absence of showing of criticality in the claimed range (MPEP 2144.05) In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claims 13 and 14, Brambilla is silent towards a method comprising temporarily permitting delivery of water such that the relative humidity less than 100% is maintained below a sub-optimal operating temperature.

St-Pierre teaches that excess accumulated water which can block flow channels is not desired if the temperature of the fuel cell stack is to be cold started or below 0°C and is remedied by operating the fuel cell in a drying condition for a period of time

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[0082]. It would have been obvious to one of ordinary skill in the art at the time of the invention to operate the fuel cell of Brambilla in a drying condition when the fuel cell stack is cold because St-Pierre teaches this allows for excess accumulated water to be removed so it does not block flow channels if the water freezes.

Regarding claims 15 and 16, Brambilla is silent towards the flow rate being controlled so that the liquid water in all regions of the fuel cell can be evaporated in the prevailing temperature and pressure conditions.

St-Pierre teaches that the humidification control for the fuel cell is dependant upon the water vapor saturation which is dependant upon temperature and pressure considerations at the fuel/oxidant inlet (common injection or supply manifolds) and outlets so that the wetting condition of the membrane is properly hydrated and excess accumulated water is not present [0050, 0078-0083]. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide water for humidification at a rate considering the temperature and pressure within the fuel cell of Brambilla because St-Pierre teaches these parameters affect the water vapor saturation which allows for proper hydration yet limiting excess water being present in the fuel cell.

Response to Arguments

8. Applicant's arguments filed September 2, 2011 have been fully considered but they are not persuasive.

Applicant's principal arguments are:

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(a) the teachings of Nonobe do not disclose or suggest determining a calibration function expressing liquid water flow rate as a function of current and/or air stoichiometry and delivering at least the minimum liquid water flow rated determined using the calibration function.

In response to Applicant's arguments, please consider the following comments:

(a) the primary reference of Brambilla discloses regulating water flow rate to maximize voltage of the single cells within the fuel cell stack. The teachings of Nonobe are used to further modify Brambilla to include determining the humidification conditions of the fuel cell based on current and voltage so that adjustments can be made to the moisture source to meet the humidification needed based on those measurements making obvious the argued limitations of the claim. Furthermore, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on (571) 272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./
Examiner, Art Unit 1727

/Barbara L. Gilliam/
Supervisory Patent Examiner, Art Unit 1727